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Maharashtra State Board Of Technical Education, Mumbai

Learning and Assessment Scheme for Post S.S.C Diploma Courses

Programme Name	**: Diploma In Computer Science & Engineering**		
Programme Code	**: CW**	**With Effect From Academic Year**	**: 2023-24**
Duration Of Programme	**: 6 Semester**	**Duration**	**: 16 WEEKS**
Semester	**: Sixth** **NCrF Entry Level : 4.0**	**Scheme**	**: K**

Sr No	Course Title	Abbrevation	Course Type	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme												
						Actual Contact Hrs./Week			Self Learning (Activity/ Assignment /Micro Project)	Notional Learning Hrs /Week		Paper Duration (hrs.)	Theory				Based on LL & TL				Based on Self Learning		Total Marks
																	Practical						
						CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
													Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
(All Compulsory)																								
1	MANAGEMENT	MAN	AEC	315301	1	3	-	-	1	4	2	1.5	30	70*#	100	40	-	-	-	-	25	10	125
2	EMERGING TRENDS IN COMPUTER ENGINEERING AND INFORMATION TECHNOLOGY	ETI	DSC	316313	-	3	-	-	1	4	2	1.5	30	70*#	100	40	-	-	-	-	25	10	125
3	SOFTWARE TESTING	SFT	DSC	316314	-	3	-	4	1	8	4	3	30	70	100	40	25	10	-	-	25	10	150
4	CLIENT SIDE SCRIPTING	CSS	AEC	316005	-	2	-	4	-	6	3	-	-	-	-	-	25	10	25@	10	-	-	50
5	MOBILE APPLICATION DEVELOPMENT	MAD	DSC	316006	-	2	-	4	2	8	4	-	-	-	-	-	25	10	25#	10	25	10	75
6	CAPSTONE PROJECT	CPE	INP	316004	-	-	-	2	2	4	2	-	-	-	-	-	50	20	50#	20	50	20	150
Elective 2 (Any - One)																								
7	DIGITAL FORENSIC AND HACKING TECHNIQUES	DFH	DSE	316315	-	3	-	2	1	6	3	3	30	70	100	40	25	10	25#	10	25	10	175
	MACHINE LEARNING	MAL	DSE	316316	-	3	-	2	1	6	3	3	30	70	100	40	25	10	25#	10	25	10	175
	NETWORK AND INFORMATION SECURITY	NIS	DSE	316317	-	3	-	2	1	6	3	3	30	70	100	40	25	10	25#	10	25	10	175
Total					**1**	**16**		**16**	**8**		**20**		**120**	**280**	**400**		**150**		**125**		**175**		**850**

Sr No	Course Title	Abbrevation	Course Type	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme										
						Actual Contact Hrs./Week			Self Learning (Activity/ Assignment /Micro Project)	Notional Learning Hrs /Week		Paper Duration (hrs.)	Theory				Based on LL & TL				Based on Self Learning		Total Marks
																	Practical						
						CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
													Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	

Abbreviations : CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment,SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends : @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :
1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.
Course Category : Discipline Specific Course Core (DSC) , Discipline Specific Elective (DSE) , Value Education Course (VEC) , Intern./Apprenti./Project./Community (INP) , AbilityEnhancement Course (AEC) , Skill Enhancement Course (SEC) , GenericElective (GE)

Programme Name/s	**: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical and Electronics Engineering/ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Computer Science/ Textile Technology/ Electronics & Computer Engg.**
Programme Code	**: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DE/ DS/ EE/ EJ/ EK/ EP/ ET/ EX/ FC/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ SE/ TC/ TE**
Semester	**: Fifth / Sixth**
Course Title	**: MANAGEMENT**
Course Code	**: 315301**

I. RATIONALE

Effective management is the cornerstone of success for both organizations and individuals. It empowers diploma engineers/ professionals to accomplish their tasks with finesse and efficiency through strategic planning and thoughtful execution, projects can optimize finances, enhance safety measures, facilitate sound decision-making, foster team collaboration and cultivate a harmonious work environment. The diploma engineers require leadership and management skills with technical knowledge of the core field to carry out various tasks smoothly. This course aims to instill fundamental management techniques, empowering diploma engineers/ professionals to enhance their effectiveness in the workplace.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the students to attain the following industry identified outcome through various teaching learning experiences: Apply the relevant managerial skills for achieving optimal results at workplace.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Use relevant management skills to handle work situation
- CO2 - Apply appropriate techniques of product, operations and project management
- CO3 - Use comprehensive tools of recent management practices

- CO4 - Plan suitable marketing strategy for a product / service
- CO5 - Utilize supply chain and human resource management techniques for effective management

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
315301	MANAGEMENT	MAN	AEC	3	-	-	1	4	2	1.5	30	70*#	100	40	-	-	-	-	25	10	125

Total IKS Hrs for Sem. : 1 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.

MANAGEMENT **Course Code : 315301**

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Justify the importance of management thoughts in Indian knowledge system. TLO 1.2 Describe the importance of management in day to day life. TLO 1.3 Explain Henry Fayol's principles of management. TLO 1.4 Describe the role of each level of management in its management hierarchy. TLO 1.5 Practice the self management skills for a given situation TLO 1.6 Apply the required managerial skills for a given situation	**Unit - I Introduction to Management** 1.1 Evolution of management thoughts from ancient/medieval to modern times in India (IKS) 1.2 Management: meaning, importance, characteristics, functions & challenges. 1.3 Introduction to scientific management- Taylor's & Fayol's principles of management 1.4 Levels & functions of management at supervisory level. 1.5 Self management skills: Self awareness, self discipline, self motivation, goal setting, time management, decision making, stress management, work life balance and multitasking 1.6 Overview of Managerial Skills: negotiation skills, team management, conflict resolution, feedback, leadership	Presentations Case Study Interactive session Quiz competition Mixed Picture Puzzle
2	TLO 2.1 Identify the appropriate creativity technique for new product development TLO 2.2 Describe the new product development process for a product / service TLO 2.3 Comprehend the importance of various strategic steps Product Management TLO 2.4 Elaborate Agile product management TLO 2.5 Explain the significance of the Project Management TLO 2.6 Describe the various tools of project management	**Unit - II Product, Operations and Project Management** 2.1 Creativity and innovation management: creativity techniques - brainstorming, checklist, reverse brainstorming, morphological analysis, six thinking hats. 2.2 New product development, change management 2.3 Product Management -meaning, strategic steps for sustainable design of a product 2.4 Agile product management- concept, benefits, principles and manifesto 2.5 Project Management: importance, areas within project management,4Ps and phases 2.6 Tools of Project Management: PERT and CPM, GANTT & Chart Overview of Estimate and Budget	Presentations Case Study Video Demonstrations Presentations Role Play

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Understand the importance of quality management tools TLO 3.2 Explain the importance of various techniques for optimization and waste minimization TLO 3.3 State the importance of ISO quality standards TLO 3.4 Describe ERP TLO 3.5 State the importance of ISO TLO 3.6 Recognize the importance of customer satisfaction as a competitive advantage	**Unit - III Management Practices** 3.1 Quality circle, kaizen, Six Sigma, TQM 3.2 5S, Kanban card system, TPM, Lean Manufacturing: Meaning, Steps and Importance 3.3 Quality Standards and ISO: Meaning, ISO 9001:2016, ISO 14000, OSHA 2020 3.4 The overview of ERP along with example 3.5 Service quality and customer/client satisfaction, servicescape	Presentation Case study Interactive session Quiz Video Demonstration Lecture Using Chalk-Board
4	TLO 4.1 Explain the importance of marketing techniques TLO 4.2 Explain the importance of needs, wants and desires in marketing TLO 4.3 Interpret the traditional and digital marketing techniques TLO 4.4 Plan different aspects of an event management	**Unit - IV Marketing Management** 4.1 Marketing management: meaning, significance, Seven P's of Marketing 4.2 Needs, wants and demands in marketing. Customer relationship management 4.3 Types of marketing: traditional and digital marketing 4.4 Event management: types, different aspects of event management, crisis management	Case Study Interactive session based video Role Play Flipped Classroom Presentations
5	TLO 5.1 State the importance of supply chain and logistics management TLO 5.2 Explain the components of supply chain and logistics Management TLO 5.3 Describe the role of information technology in supply chain & logistics management TLO 5.4 State the significance of Human Resource Management TLO 5.5 Analyze the various methods of recruitment, selection and training for an organization TLO 5.6 List the qualities of a successful supervisor	**Unit - V Supply Chain & Human Resource Management** 5.1 The overview of Supply Chain and logistics Management 5.2 Components of Supply Chain and logistics Management 5.3 Role of information technology in supply chain & logistics management 5.4 Overview of Human Resource Management-Meaning,significance,scope and principles 5.5 Recruitment, selection and training of human resources. Chalk Circle 5.6 Qualities of a successful supervisor /team leader and types of leadership	Presentations Video Demonstrations Case Study Collaborative learning Video Demonstrations Chalk-Board

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES : NOT APPLICABLE.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Assignment / Article

- Make a one page note based on a book of management you read.
- Write a short article on inventory management exploring online learning resources.
- Prepare a report on ISO standards applicable to your field. a. IATF 16949-2016 / SLA-TS 16949-2016, - Automotive Industry b. ISO 22000 — Food safety management c. ISO 50001 — Energy management d. ISO/IEC 27001 - Cyber Security e. ISO/DIS 4931-1 - Buildings and civil engineering works
- Prepare a 4 quadrant matrix of time management for managing the tasks.
- Prepare a report on any one software used for Supply Chain and Logistics Management.
- Prepare a GANTT Chart for project management related to your field.

Note Taking

- Watch a Tedx Talk Video on managerial skills and take notes in the form of keywords.

Case Study

- Prepare a case study and discuss the same on following topics a.Self Management Skills b.Six Thinking Hats c.Kaizen d.Quality Circle e.Safety Measures in different organizations related to your field
- Study the recruitment and selection process of any organization related to your field.
- Prepare a case study on management lessons based on life of Chhatrapati Shivaji Maharaj
- Conduct outbound training on managerial skills. Make a video and upload on social media.

Quizes

- Participate in online quizzes related to areas of management .

Assignment

- Workshops to be conducted for students on following topics a. creativity techniques b. time management c. stress management d. negotiation and conflict e. goal setting f. meditation new product development

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED : NOT APPLICABLE

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Management	CO1	13	8	6	4	18
2	II	Product, Operations and Project Management	CO2	8	2	4	6	12
3	III	Management Practices	CO3	8	4	4	6	14
4	IV	Marketing Management	CO4	8	2	4	6	12
5	V	Supply Chain & Human Resource Management	CO5	8	4	4	6	14
Grand Total				**45**	**20**	**22**	**28**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- MCQ Based Class Test, Self Learning Activities / Assignment

Summative Assessment (Assessment of Learning)

- Summative Assessment (Assessment of Learning) MCQ based

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	1	1	1	-	-	2	3			
CO2	1	3	3	-	1	3	3			
CO3	1	3	1	-	1	1	3			
CO4	1	2	2	-	1	2	3			
CO5	1	1	2	-	1	2	3			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	A. K. Gupta	Engineering Management	S. Chand, ISBN: 81-219-2812-5, 2007, 2nd Edition
2	O. P. Khanna	Industrial Engineering &management	Dhanpat Rai Publication, ISBN: 978-8189928353, 2018
3	Harold Koontz and Heinz Weinrich	Essentials of Management	Tata McGraw Hill Education ISBN: 9789353168148, 2020, 12th edition
4	E. H. McGrath	Basic Managerial Skills for All	PHI ISBN: 978-8120343146, 2011, 9th Edition
5	Andrew DuBrin	Management Concepts and Cases	Cengage Learning, ISBN: 978-8131510537, 2009, 9th edition
6	K. Dennis Chambers	How Toyota Changed the World	Jaico Books ISBN: 978-81-8495-052-6, 2009
7	Jason D. O'Grandy	How Apple changed the Wolrd	Jaico Publishing House ISBN: 978-81-8495-052-0, 2009
8	Subhash Sharma	Indian Management	New Age International Private Limited ; ISBN-978-9389802412, 2020, 1st edition
9	Chitale, Dubey	Organizational Behaviour Text and Cases	PHI LEARNING PVT. LTD., ISBN: 978-9389347067, 2019, 2nd Edition

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.debonogroup.com/services/core-programs/six-thinking-hats/	Six Thinking Hats
2	https://hbr.org/1981/09/managing-human-resources	HR Management
3	https://theproductmanager.com/topics/agile-product-management/	Agile Product Management
4	https://www.cdlogistics.ca/freight-news/the-5-components-of-supply-chain-management	Supply Chain Management
5	https://www.infosectrain.com/blog/understanding-the-concepts-of-gantt-chart-and-critical-path-methodology-cpm	PERT, CPM, GANTT Chart
6	https://www.simplilearn.com/best-management-tools-article	Management Tools
7	https://www.psychometrica.in/free-online-psychometric-tests.html	Psychometric Tests
8	https://www.investopedia.com/terms/e/erp.asp	ERP
9	https://asq.org/quality-resources/quality-management-system	QMS
10	https://testlify.com/test-library/creative-thinking/	Psychometric Tests
11	https://www.mindtools.com/	Management Skills
12	https://www.investopedia.com/terms/d/digital-marketing.asp	Digital Marketing

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

SOFTWARE TESTING **Course Code : 316314**

Programme Name/s	**: Computer Technology/ Computer Engineering/ Computer Science & Engineering/ Computer Hardware & Maintenance/ Computer Science & Information Technology/ Computer Science**
Programme Code	**: CM/ CO/ CW/ HA/ IH/ SE**
Semester	**: Sixth**
Course Title	**: SOFTWARE TESTING**
Course Code	**: 316314**

I. RATIONALE

This curriculum teaches software testing methods, including manual and automation testing, performance, and security testing. With the growing demand for skilled testers in various development organizations, this course prepares students for industry roles as software tester. Hands-on experience with tools like Selenium helps them apply their knowledge and skill effectively. By completing this course, students gain valuable skills for career in software quality assurance.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Develop strong testing skills along with proficiency in tools like Selenium to ensure software quality.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Explain various software testing methods.
- CO2 - Prepare test cases for different levels of testing.
- CO3 - Prepare test plan for a given application.
- CO4 - Create defect report for a given application.
- CO5 - Apply automation testing tools to test software.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
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															Practical							
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
316314	SOFTWARE TESTING	SFT	DSC	3	-	4	1	8	4	3	30	70	100	40	25	10	-	-	25	10	150

Total IKS Hrs for Sem. : Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
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V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Identify errors and bugs in the given program. TLO 1.2 Explain the Entry and Exit Criteria for the given test application. TLO 1.3 Explain various types of Software Testing methods.	**Unit - I Software Testing and Testing Methods** 1.1 Software Testing, Objectives of Testing, Software Requirement Specification (SRS) 1.2 Failure, Error, Fault, Defect, Bug Terminology 1.3 Test Case, Entry and Exit Criteria for Testing 1.4 Methods of Testing: Static and Dynamic Testing 1.5 White Box Testing: Inspections, Walkthroughs, Technical Review, Functional Testing, Code Coverage Testing, Code Complexity Testing 1.6 Black Box Testing: Requirement Based Testing, Boundary Value Analysis and Equivalence Partitioning	Lecture Using Chalk-Board Presentations Video Demonstrations
2	TLO 2.1 Apply the concepts of unit testing. TLO 2.2 Explain different integration testing strategies. TLO 2.3 Apply the principles and methods of system testing. TLO 2.4 Explain the purpose and process of acceptance testing. TLO 2.5 Apply various special testing techniques. TLO 2.6 Prepare test case for the given application.	**Unit - II Types and Levels of Testing** 2.1 Unit Testing: Driver, Stub 2.2 Integration Testing: Top-Down Integration, bottom-Up Integration, Bi-Directional Integration 2.3 System Testing 2.4 Acceptance Testing: Alpha, Beta Testing 2.5 Special Testing: Performance Testing-Load Testing and Stress Testing, Regression Testing, Security Testing, Client-Server Testing, GUI Testing, Database Testing, Sanity and Smoke Testing	Lecture Using Chalk-Board Presentations Video Demonstrations

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Prepare test plan and test cases for the given application. TLO 3.2 Apply test infrastructure and people management strategies. TLO 3.3 Identify base lining of test plans. TLO 3.4 Prepare test report of executed test cases for the given application.	**Unit - III Test Management** 3.1 Test life cycle 3.2 Test Planning: Preparing a Test Plan, Deciding the Test Approach, Setting Up Criteria for Testing, Identifying Responsibilities, Staffing, Resource Requirements, Test Deliverables, Testing Tasks 3.3 Test Management: Test Infrastructure Management, Test People Management 3.4 Test Process: Base Lining a Test Plan, Test Case Specification 3.5 Test Reporting: Executing Test Cases, Preparing Test Summary Report	Lecture Using Chalk-Board Presentations Video Demonstrations
4	TLO 4.1 Classify defects on the basis of estimated impact. TLO 4.2 Prepare defect template for the given application. TLO 4.3 Explain defect management process on the given application.	**Unit - IV Defect Management** 4.1 Defect Classification, Defect Management Process 4.2 Defect Life Cycle, Defect Template 4.3 Estimate Expected Impact of a Defect, Techniques for Finding Defects, Reporting a Defect	Lecture Using Chalk-Board Presentations Video Demonstrations
5	TLO 5.1 Identify different testing tools to test the given application. TLO 5.2 Improve testing efficiency using automated tool for given application. TLO 5.3 Apply testing tool to test the given application. TLO 5.4 Describe Metrics and Measurement for the given application.	**Unit - V Testing Tools and Measurements** 5.1 Manual Testing verses Automation Testing, advantages and disadvantages of using Testing Tools 5.2 Selecting a Test Tool: Criteria for Selecting Test Tools, Steps for Tool Selection and Deployment 5.3 Selenium: Introduction and Components, Automation Testing Tools 5.4 Selenium IDE: Introduction, Features, Limitations 5.5 Selenium WebDriver: Introduction, advantages and disadvantages 5.6 Metrics and Measurement: Types of Metrics, Product Metrics and Process Metric	Lecture Using Chalk-Board Presentations Video Demonstrations

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Write test cases for purchase management system.	1	*Design test cases for purchase order management based on system specification	2	CO1
LLO 2.1 Write test cases for Inventory management System.	2	*Design test cases for Inventory management System based on System Specification	2	CO1
LLO 3.1 Write test cases for simple calculator application.	3	Design test cases for calculator to verify its functionality (Black Box Testing)	2	CO1

SOFTWARE TESTING **Course Code : 316314**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 4.1 Write test cases for hostel admission form.	4	Design test cases for hostel admission form	2	CO1
LLO 5.1 Write test cases for different tasks (OTP Verification, Image Upload) in any software module using equivalence partitioning and boundary value analysis of black box testing.	5	*Design test cases for different tasks (OTP Verification, Image Upload) in any software module using black box testing	2	CO1
LLO 6.1 Write test cases for railway reservation System.	6	Test various functionality of railway reservation system	2	CO2
LLO 7.1 Prepare test cases for e-commerce login form.	7	*Validate login procedure for E-Commerce Application (Flipkart or Amazon)	2	CO2
LLO 8.1 Write test cases for web page testing any web site.	8	Test functionality of Web Pages of any website	2	CO2
LLO 9.1 Write program and design test cases for-For...Loop. LLO 9.2 Write program and design test cases for-Do...While Loop. LLO 9.3 Write program and design test cases for-Switch Case. LLO 9.4 Write program and design test cases for-if...else.	9	*Design Test Cases for Control and Decision Making Statements (Use C Language)	2	CO2
LLO 10.1 Prepare test cases for online mobile recharge.	10	*Design test cases for online mobile recharge	2	CO2
LLO 11.1 Prepare test cases for flight ticket booking system.	11	*Design test cases for flight ticket booking system	2	CO2
LLO 12.1 Write test plan and test cases for elevator.	12	Design test plan and cases for elevator	2	CO3
LLO 13.1 Write test plan and test cases for Notepad Application.	13	*Design test plan and test cases for Notepad (MS Window based) Application	2	CO3
LLO 14.1 Create test report of executed test cases for any website.	14	Prepare test report for any website	2	CO3
LLO 15.1 Prepare test cases and test summary report for a travel booking application.	15	*Design test cases and test summary report for a travel booking application	2	CO3
LLO 16.1 Write test plan and test cases for the login functionality of a social media application.	16	*Design test plan and test cases for the login functionality of a social media application	2	CO3
LLO 17.1 Prepare defect report after executing test cases for library management system.	17	*Generate Defect Report for Library Management System	2	CO4
LLO 18.1 Prepare defect report after executing test cases for withdrawn of amount from ATM Machine.	18	*Validate Defect Report for ATM Machine	2	CO4
LLO 19.1 Prepare defect report after executing test cases for any login form.	19	Execute Test Cases to Generate Defect Report for any login form	2	CO4
LLO 20.1 Prepare defect report after executing test cases for hostel admission form.	20	Defect Report for Hostel Admission Form	2	CO4

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 21.1 Install and configure Selenium IDE to apply automation testing concepts.	21	*Installation and Configuration of Selenium IDE.	2	CO5
LLO 22.1 Write and run test cases for Notepad using Selenium IDE.	22	*Test Case Design and Execution for Notepad (Windows-Based) Using Selenium IDE	4	CO5
LLO 23.1 Write and run test cases for MS Word application using Selenium IDE.	23	Test Case Design and Execution for MS Word application using Selenium IDE	4	CO5
LLO 24.1 Install and configure Selenium WebDriver to apply automation testing concepts.	24	*Installation and Configuration of Selenium WebDriver	2	CO5
LLO 25.1 Apply browser automation techniques using Selenium WebDriver to automate tasks such as opening a URL, navigating, and closing.	25	*Browser Automation with WebDriver	4	CO5
LLO 26.1 Apply techniques to automate switching between multiple browser windows or tabs using Selenium WebDriver.	26	Handling Multiple Windows and Tabs in WebDriver	4	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Test the checkout process in an online clothing store.
- Validate the functionality of a product search feature in an electronics e-commerce site.
- Validate the functionality of a weather API in a mobile app.
- Evaluate the performance of a login page under different user loads.
- Validate the accuracy of patient data in a hospital management system.
- Any micro project topic suggested by faculty on similar line.

Other

- Complete the Software Testing course NPTEL Platform.
- Complete the Software Testing Fundamentals course Infosys Springboard.

Assignment

- Explain various types of Software Testing methods.
- Draw defect prevention process cycle. State working of each phase.
- Design test cases for online mobile recharge.
- Differentiate between Smoke Testing and Sanity Testing.
- Describe need for automation testing tools.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Selenium (IDE and WebDriver)	21,22,23,24,25,26
2	Computer System with processor i3 and above, RAM minimum 4 GB	All
3	Spreadsheet Package (Microsoft excel)	All
4	Lean software testing tool, Bugzilla, QTP and RTP Software Testing Tool, loadrunner Software Testing Tool, GTMetrix, Notepad (Any Open Source Software Testing Tool)	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Software Testing and Testing Methods	CO1	9	4	6	4	14
2	II	Types and Levels of Testing	CO2	12	6	6	6	18
3	III	Test Management	CO3	9	4	6	4	14
4	IV	Defect Management	CO4	6	2	4	4	10
5	V	Testing Tools and Measurements	CO5	9	4	6	4	14
Grand Total				**45**	**20**	**28**	**22**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- The marks of two offline unit tests, each 30 marks, will be considered, and the average of the two unit test marks will be calculated out of 30 marks.
- Each practical will be assessed with 60% weightage given to the process and 40% weightage given to the product.
- The formative assessment of laboratory learning will be of 25 marks.

Summative Assessment (Assessment of Learning)

- End semester examination, Lab performance, Viva voce.

XI. SUGGESTED COS - POS MATRIX FORM

SOFTWARE TESTING **Course Code : 316314**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	1	1	-	-	-	-	1			
CO2	1	2	3	1	1	-	1			
CO3	1	2	3	1	1	1	-			
CO4	1	3	1	1	1	-	-			
CO5	-	1	2	3	1	-	-			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Srinivasan Desikan, Gopalaswamy Ramesh	Software Testing: Principles and Practices	Pearson India, 2016, ISBN: 9788177581218
2	Limaye M. G.	Software Testing: Principles, Techniques and Tools	Tata McGraw Hill Education, New Delhi, 2012, ISBN(13): 9780070139909
3	Chauhan Naresh	Software Testing: Principles and Practices	Oxford University Press, 2016, ISSN: 9780198061847
4	Kalilur Rahman	Science of Selenium Master Web UI Automation and Create Your Own Test Automation Framework	Bpb Publications, 2019, ISBN: 9789389423242, 9389423244
5	Singh Yogesh	Software Testing	Cambridge University Press, 2012, ISBN 978-1-107-65278-1

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013841792861315072425 4_shared/overview	Infosys Springboard - Software Testing Fundamentals course
2	https://www.geeksforgeeks.org/software-testing-basics/	Software Testing Tutorials
3	https://www.w3schools.in/software-testing/tutorials/	Software Testing Tutorials
4	https://www.geeksforgeeks.org/defect-management-process/	Software Testing – Defect Management Process
5	https://www.lambdatest.com/learning-hub/selenium-ide	Introduction to Selenium IDE
6	https://www.geeksforgeeks.org/introduction-to-selenium-webdriver/	Introduction to Selenium WebDriver
7	https://www.geeksforgeeks.org/software-measurement-and-metrics/	Software Testing – Software Measurement and metrics
8	https://nptel.ac.in/courses/106101163	Software Testing Course

SOFTWARE TESTING **Course Code : 316314**

Sr.No	Link / Portal	Description
9	https://nptel.ac.in/courses/106105150	Software Testing Course

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

MSBTE Approval Dt. 04/09/2025 **Semester - 6, K Scheme**

CLIENT SIDE SCRIPTING **Course Code : 316005**

Programme Name/s	**: Computer Technology/ Computer Engineering/ Computer Science & Engineering/ Information Technology/ Computer Science & Information Technology/ Computer Science**
Programme Code	**: CM/ CO/ CW/ IF/ IH/ SE**
Semester	**: Sixth**
Course Title	**: CLIENT SIDE SCRIPTING**
Course Code	**: 316005**

I. RATIONALE

Client-side scripting plays a fundamental role in modern web development by enhancing user interactions and improving the overall experience of websites and applications. Web developers utilize it extensively to accomplish tasks like creating dynamic webpages, reacting to events, making interactive forms, verifying information entered by visitors, managing the browser, and more. Using these characteristics, this course assists students in creating highly dynamic web pages.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcomes through various teaching learning experiences :
Develop web application using AngularJS and React Framework.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Develop web page using client side scripting technology.
- CO2 - Design dynamic web pages using AngularJS.
- CO3 - Implement the built-in functions and objects in AngularJS.
- CO4 - Develop web application using React.
- CO5 - Apply event handling in React Framework.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
316005	CLIENT SIDE SCRIPTING	CSS	AEC	2	-	4	-	6	3	-	-	-	-	-	25	10	25@	10	-	-	50

Total IKS Hrs for Sem. : 0 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Explain purpose of scripting language. TLO 1.2 Differentiate between static and dynamic web pages. TLO 1.3 Describe the evolution of scripting technologies. TLO 1.4 Illustrate the AJAX architecture. TLO 1.5 Create JSON objects for accessing data in JavaScript program. TLO 1.6 Explain feature of Django and Flask framework.	**Unit - I Fundamental of Client Side Scripting** 1.1 Introduction to the Scripting: Basic web architecture, Role of the client and server, Static vs. dynamic web pages 1.2 History of Scripting Technologies: HTML as a foundation, Early use of inline scripting, Limitations of static HTML, JavaScript 1.3 Introduction to AJAX : AJAX Architecture, Actions 1.4 Basics of JSON: Objects, Scheme 1.5 Webpage with Python: Django and Flask framework	Lecture Using Chalk-Board Presentations Hands-on

CLIENT SIDE SCRIPTING **Course Code : 316005**

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Describe the MVC Architecture. TLO 2.2 State structure of the given AngularJS web page. TLO 2.3 Describe the function of different controls to be used in web form. TLO 2.4 Implement the filters and directives in given page. TLO 2.5 Write AngularJS program to handle the web page events.	**Unit - II Angular Basics** 2.1 Introduction to AngularJS: AngularJS Extends HTML, Expressions, MVC Architecture, Application in AngularJs, Variables Scope 2.2 AngularJS Forms: FORM tag, Form fields: Single line text field, password field, multiple line text area, radio buttons, and check boxes. Pull down menus: SELECT and OPTION tags. Buttons: submit, reset and generalized buttons, Form Validation 2.3 AngularJS Data Binding :Two-way Binding and ng-model directive 2.4 Filters: Built-In Filters, Custom Filter, Chaining Multiple Filters 2.5 AngularJS Events: ng-mousedown, ng-mouseup, ng-click	Lecture Using Chalk-Board Presentations Hands-on
3	TLO 3.1 Identify the table attributes to organize data in web page. TLO 3.2 Write CSS code for applying type of formatting in web page. TLO 3.3 Describe the use of controllers and its method. TLO 3.4 Write AngularJS program using filters. TLO 3.5 Write AngularJS program to show use of external files in controller.	**Unit - III Working with AngularJS** 3.1 AngularJS Tables: Display Data in a Table, Adding style to the Table data, orderBy Filter, uppercase Filter, Table Index, using $even and $odd 3.2 AngularJS Controllers: Initializing the Model with Controllers, Role of a Controller, Controllers & Modules, Controller Business Logic, Presentation Logic and Formatting Data 3.3 Attaching Properties and functions to scope 3.4 Nested Controllers, Using Filters in Controllers 3.5 Controllers in External Files	Lecture Using Chalk-Board Presentations Hands-on
4	TLO 4.1 State the features of React. TLO 4.2 Describe the life cycle of React. TLO 4.3 Explain the use of different components in a form. TLO 4.4 Implement the state of React Hooks.	**Unit - IV Introduction of React Framework** 4.1 Introduction to React Framework, features, architecture & Form 4.2 Components: Functional components, Class components, Passing and using props 4.3 Lifecycle – Mounting, Updating and Unmounting 4.4 React Hooks – useState,useEffect, useContext	Lecture Using Chalk-Board Presentations Hands-on

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
5	TLO 5.1 Write JavaScript to design a form to accept input values using React. TLO 5.2 Write event driven program for the given problem using React. TLO 5.3 Explain the use of list and keys in web pages. TLO 5.4 Write CSS for React application.	**Unit - V Working with React Framework** 5.1 Event handling, Binding event handlers, Arrow functions vs. regular functions 5.2 Working with Forms - Adding components, Handling form, Submitting Forms, Form validation 5.3 Lists and Keys - Rendering Lists, List with Key, Using map() to render lists of elements 5.4 Cascading Style Sheets- Different types of Style Sheets, Styling Libraries, Popular CSS frameworks (e.g., Bootstrap, Material-UI)	Lecture Using Chalk-Board Presentations Hands-on

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Create web page using structure tags to display sample message.	1	* Write a program to display " Hello World " using: • Console.log() • document.write( ) • alert ()	2	CO1
LLO 2.1 Create Python script to display sample message.	2	Write a program to display "Welcome " using Python script	2	CO1
LLO 3.1 Write programs a JSON Object with properties and access the object using JSON.	3	Create objects for the given problem with JSON	4	CO1
LLO 4.1 Install Angular software application.	4	1. Setup Angular development environment using: • Installation of Node.js and npm • Installation of Angular CLI 2. Write a program to display "Good Morning " Message on web page	2	CO2
LLO 5.1 Use forms controls.	5	* Write AngularJS program to design form using various controls and apply validations on input	4	CO2
LLO 6.1 Implement data binding in AngularJS.	6	* Write a program to display data model view and display data for given problem	2	CO2
LLO 7.1 Implement data binding synchronization between the model and the view.	7	Write a program to display two - way data binding	2	CO2
LLO 8.1 Use filters in AngularJS.	8	*Write a program to implement different filters in AngularJS	2	CO2
LLO 9.1 Implement various keys and mouse events.	9	* Write a program to implement different events in Angular JS	2	CO2

CLIENT SIDE SCRIPTING **Course Code : 316005**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 10.1 Create a web page to implement table.	10	Write a program displaying data in a table	2	CO3
LLO 11.1 Implement table operation using filters.	11	* Write a program to implement CSS to table data-odd and even rows	2	CO3
LLO 12.1 Develop Angular JS applications using controllers.	12	* Write programs for implementation of different methods of AngularJS Controllers	2	CO3
LLO 13.1 Use concept of controllers external files.	13	* Write programs to demonstrate use of controllers in external files	4	CO3
LLO 14.1 Execute after writing program to handle data using React form.	14	* Write a program to handle data using React form	2	CO4
LLO 15.1 Execute after writing program passing function argument into React component.	15	Write a program to pass function argument into React component	2	CO4
LLO 16.1 Implement the concept of React life cycle.	16	*Write a program to pass function argument into React program and implemnt the life cycle of React	2	CO4
LLO 17.1 Implement states of React Hooks.	17	* Write a program to implement states of React Hooks	4	CO4
LLO 18.1 Use React components to design real time form.	18	Write a program to design real time form using react components	4	CO5
LLO 19.1 Apply validations for React form.	19	Write a program to apply validations for React form	4	CO5
LLO 20.1 Use concept of List using React.	20	* Write a program to manipulate List using key and without key in React	2	CO5
LLO 21.1 Create a page to use map function in React.	21	Write a program to render a list using map function in React	2	CO5
LLO 22.1 Implement different approaches for styling a React web page.	22	* Write a program to apply following approaches of css to a React web page • Inline styling • CSS stylesheets • CSS Modules	2	CO5
LLO 23.1 Carry out a microproject on the given problem statement.	23	* The microproject has to be web based real time application suggested by teacher such as : • Develop a web "Chat Application" having Chat window with send and recive the text,image etc. • Develop a web "Music Player application" where user can get the Album with signer and play the music.	4	CO2 CO3 CO4 CO5

CLIENT SIDE SCRIPTING **Course Code : 316005**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) : NOT APPLICABLE

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system with all necessary peripherals and internet connectivity Node.js and npm Angular CLI OR Visual Studio Code IDE	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Fundamental of Client Side Scripting	CO1	5	0	0	0	0
2	II	Angular Basics	CO2	6	0	0	0	0
3	III	Working with AngularJS	CO3	6	0	0	0	0
4	IV	Introduction of React Framework	CO4	6	0	0	0	0
5	V	Working with React Framework	CO5	7	0	0	0	0
Grand Total				**30**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continous assessment based on process and product related performance indicators.Each practical will be assessed considering-

-60% weightage to process
-40% weightage to product

Summative Assessment (Assessment of Learning)

- End Semester Examination (Lab. performance),Viva-voce

XI. SUGGESTED COS - POS MATRIX FORM

CLIENT SIDE SCRIPTING **Course Code : 316005**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	1	-	1	1	-	-	1			
CO2	2	2	2	2	1	-	1			
CO3	2	2	3	3	2	-	1			
CO4	2	2	2	3	2	-	1			
CO5	2	2	3	3	2	-	1			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Thomas A. Powell	HTML & CSS: The Complete Reference	McGraw Hill Education; 5th edition (1 July 2017), ISBN-13 : 978-0070701946
2	Valeri Karpov, Diego Netto	Professional AngularJS (WROX)	Wiley (1 January 2015), ISBN-13 : 978-8126556434
3	Brad Green, Shyam Seshadri	AngularJS: Less Code, More Fun, And Enhanced Productivity With Structured Web Apps (Greyscale Indian Edition)	Shroff/O'Reilly; First Edition (1 January 2013), ISBN-13 : 978-9351101260
4	Mayur Patil	React.js For Beginners	Notion Press (11 January 2023), ISBN-13 : 979-8889355106
5	Alex Banks	Learning React: Modern Patterns for Developing React Apps	Shroff/O'Reilly; Second edition (16 July 2020), ISBN-13 : 978-9385889158

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.tutorialspoint.com/angular/index.htm	Designing web page using AngularJS. (All contents)
2	https://www.w3schools.com/angular/	AngularJS Tutorial for beginners
3	https://www.w3schools.com/REACT/DEFAULT.ASP	React Tutorial for beginners
4	https://www.tutorialspoint.com/reactjs/index.htm	Designing web page using React.(All contents)
5	https://javascript.info/	The Modern JavaScript Tutorial
6	https://www.javascripttutorial.net/react-tutorial/	Providing React,AngularJS and Javascript contents.
7	https://www.youtube.com/watch?v=NSWzs-Jt65w	Angular JS for Beginners

CLIENT SIDE SCRIPTING **Course Code : 316005**

Sr.No	Link / Portal	Description

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

MOBILE APPLICATION DEVELOPMENT **Course Code : 316006**

Programme Name/s	**: Artificial Intelligence/ Artificial Intelligence and Machine Learning/ Cloud Computing and Big Data/ Computer Technology/ Computer Engineering/ Computer Science & Engineering/ Data Sciences/ Computer Hardware & Maintenance/ Information Technology/ Computer Science & Information Technology/ Computer Science**
Programme Code	**: AI/ AN/ BD/ CM/ CO/ CW/ DS/ HA/ IF/ IH/ SE**
Semester	**: Sixth**
Course Title	**: MOBILE APPLICATION DEVELOPMENT**
Course Code	**: 316006**

I. RATIONALE

Android OS is one of the fastest growing environments which are widely used by smartphones, smart T.V, tablets and other equipments. Mobile Application Development course helps to design and covers the concepts which are required to understand and develop Android based applications.After completing this course students will be able to design, build and publish real-time Android applications.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the students to attain the following Industry Identified Outcomes through various teaching learning experiences:

• Build real-time Android applications.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Interpret the features of android operating system.
- CO2 - Use after configuring Android development environment.
- CO3 - Develop android applications using UI components and layouts.
- CO4 - Create database driven Android applications.
- CO5 - Develop advanced Android applications that requires relevant permissions for security.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical							
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
316006	MOBILE APPLICATION DEVELOPMENT	MAD	DSC	2	-	4	2	8	4	-	-	-	-	-	25	10	25#	10	25	10	75

Total IKS Hrs for Sem. : 0 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Differentiate between Android and other operating systems. TLO 1.2 Enlist Android OS features. TLO 1.3 Explain android architecture. TLO 1.4 Identify IDEs for Android Application development.	**Unit - I Basics of Android OS** 1.1 Introduction to Android Operating System 1.2 Need and features of Android 1.3 Android Architecture Framework 1.4 Introduction to Android Application Development IDE (Android Studio, Eclipse, Visual Studio with Xamarin etc.)	Lecture Using Chalk-Board Hands-on
2	TLO 2.1 Explain JDK and SDK for developing Mobile application. TLO 2.2 Explain different Android tools. TLO 2.3 Distinguish between DVM and JVM. TLO 2.4 Explain various Android terminologies. TLO 2.5 Explain relevant analogy of Android directory structure.	**Unit - II Introduction to Android Environment** 2.1 Use of Java JDK and introduction to Android SDK 2.2 Different Android tools like Android Development Tools (ADT), Android Virtual Devices (AVD) and emulators 2.3 Dalvik Virtual Machine (DVM) , difference between DVM and JVM 2.4 Terminologies in Android : Android Run Time (ART), Over the Air (OTA), Firmware Over The Air (FOTA), Global Positioning System (GPS) , Google Cloud Messaging (GCM) 2.5 Android directory structure	Hands-on Demonstration

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Describe to develop user interface for the given Android application. TLO 3.2 List steps to implement different layouts. TLO 3.3 Explain the process of developing Android application using given Android views. TLO 3.4 Write the steps to design Splash screen.	**Unit - III Design UI in Android** 3.1 GUI components like : Text View, Edit Text, Button, types of buttons like image button , toggle button, Checkbox, Radiobutton, Radiobutton Group, Progress bar, Scrollbars, List, Custom Toast Alert message etc. 3.2 Introduction to Layouts and types of Layouts : Constraint layout, Linear Layout, Frame Layout, Relative Layout etc. 3.3 Introduction to views and its types : List view, Grid view, Image view, Scroll view 3.4 Basics of splash screen , adding styles to splash screen	Demonstration Hands-on
4	TLO 4.1 Explain the use of given components for Android application development. TLO 4.2 Explain the use of different life cycle methods to develop Android Application. TLO 4.3 Write the steps to establish database connectivity to fire queries for performing the given database management operations.	**Unit - IV Android Components and Database Connectivity** 4.1 Major components in Android : Intent, Activity, Services, Broadcast Receiver 4.2 Life cycle of Android components like Activity, Broadcast Receiver, Services etc. 4.3 SQLite/Firebase database, necessity of SQLite/Firebase, creation and connection of the database, extracting data from the databases	Lecture Using Chalk-Board Presentations
5	TLO 5.1 Write the stpes to implement various advanced android concepts to develop an application. TLO 5.2 Explain the process to apply security services in android application development. TLO 5.3 Write steps to publish the given android application.	**Unit - V Android Application Deployment** 5.1 Advanced Concepts : Fragments,Location based services, SMS telephony, Audio capture, Camera, Bluetooth etc. 5.2 Security Concepts : Android security model, declaring and using permissions, using custom permission 5.3 Application Deployment : Process for creating and deploying Android applications on Google Play store, become a publisher	Presentations Lecture Using Chalk-Board

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Install any Android IDE .	1	*Install Android IDE and create Android virtual device	2	CO1
LLO 2.1 Use IDE to wirte and exceute Java program for Android application.	2	Develop a program to display “Hello World” on screen	2	CO2
LLO 3.1 Change the attributes in the directory structure.	3	*Explore the directory structure in Android IDE	2	CO2

MOBILE APPLICATION DEVELOPMENT **Course Code : 316006**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 4.1 Develop a program to implement Auto complete Text View and Edit Text.	4	* Develop android application using View Text and Edit Text.	2	CO3
LLO 5.1 Use different types of buttons in Android application.	5	*Develop a program to implement Button, Image Button and Toggle Button	2	CO3
LLO 6.1 Write a program to demonstrate the use of Checkbox and Radiobutton.	6	*Develop a program to design Checkbox and Radiobutton.	2	CO3
LLO 7.1 Implement progress Bar in android application.	7	Develop a program to implement Progress Bar	2	CO3
LLO 8.1 Create a login form using various UI components.	8	*Develop a program to create a login form using the above UI controls	2	CO3
LLO 9.1 Build android application using Linear and Constraint Layouts.	9	* Write program to implement Linear layout and Constraint layout to create any registration form with Custom Toast Alert	2	CO3
LLO 10.1 Develop android application using Frame, Table and Relative Layout.	10	Develop a program to implement Frame layout, Table layout and Relative layout for any e-commerce application	2	CO3
LLO 11.1 Create Android application to implement different types of views.	11	*Develop a program to implement Grid View, Image View, Scroll View, List View for any management system like library management/hotel management	2	CO3
LLO 12.1 Create an application to implement grid layout.	12	Develop a simple calculator which uses grid layout and GUI concepts	2	CO3
LLO 13.1 Write program to develop relevant GUI for given application.	13	* Develop a splash screen in android	2	CO3
LLO 14.1 Design a convertor application.	14	*Design and develop any convertor application like temperature convertor /currency convertor/ volume convertor	2	CO3
LLO 15.1 Implement a timer application.	15	Design and develop a simple countdown timer	2	CO3
LLO 16.1 Construct a date picker in application.	16	*Develop a program to implement Date Picker in application	2	CO3
LLO 17.1 Construct a time picker in application.	17	Develop a program to implement Time Picker in application	2	CO3
LLO 18.1 Create android activities.	18	Develop a program to create two simple activities for Login application	2	CO3
LLO 19.1 Implement intents in android application development.	19	*Develop a program to implement new Activity using explicit intent and implicit intent to open any other website	2	CO4
LLO 20.1 Implement android services to develop android applications.	20	*Develop a program to implement services like bluetooth/wifi	2	CO4
LLO 21.1 Implement the concept of broadcast receiver to develop and android application.	21	*Develop a program to implement a broadcast receiver to switch between different modes like Airplane mode/Silent Mode/Loud Mode	2	CO4

MOBILE APPLICATION DEVELOPMENT **Course Code : 316006**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 22.1 Implement the database operations with android front end.	22	*Develop a registration application to insert and retrieve the data from the database	2	CO4
LLO 23.1 Create an Android application for user authentication .	23	Develop an authentication application which uses database concepts	2	CO4
LLO 24.1 Develop an application which uses database.	24	Develop a MyContacts application which uses database concepts	2	CO4
LLO 25.1 Create Android application that uses camera with permissions.	25	Develop a program to use camera	2	CO5
LLO 26.1 Create application to Send and Receive SMS.	26	* Write a program for SMS application	2	CO5
LLO 27.1 Implement an email application.	27	*Develop a program to send and receive email	2	CO5
LLO 28.1 Develop GPS application.	28	Write a program that uses location services and checks for permissions	2	CO5
LLO 29.1 Build an Navigation drawer application.	29	*Write a program that creates Navigation drawer using fragment concepts	2	CO5
LLO 30.1 Build an torch application.	30	Write a program to create a simple flashlight app and check for permissions	2	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- The micro project has to be industry based, internet based ,laboratory based or field based as suggested by teacher.

a) Simple chatting application - A real-time chat application is a software application that enables users to exchange messages and communicate with each other in real-time.
b) Class time-table application - It helps to keep track of your classes but also allows you to add events to your weekly schedule.

Other

- Complete course of Android App Development on NPTEL
- Complete course of Android Development Courses on Spoken Tutorial

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Any compatible open source Android IDE (like - Android Studio, Eclipse,Visual Studio with Xamarin with SQLite / Firebase database compatibility)	All
2	Computer System (Computer system with i3 and above processors which is available in the laboratory with minimum 8GB RAM)	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Basics of Android OS	CO1	2	0	0	0	0
2	II	Introduction to Android Environment	CO2	2	0	0	0	0
3	III	Design UI in Android	CO3	6	0	0	0	0
4	IV	Android Components and Database Connectivity	CO4	10	0	0	0	0
5	V	Android Application Deployment	CO5	10	0	0	0	0
Grand Total				**30**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continuous Assessment based on Process and Product related Performance Indicators. Each Practical will be assessed considering:

60% weightage is to Process.
40% weightage is to Product.

Summative Assessment (Assessment of Learning)

- Laboratory Performance, Viva Voce

XI. SUGGESTED COS - POS MATRIX FORM

MOBILE APPLICATION DEVELOPMENT **Course Code : 316006**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	-	-	1	-	-	-			
CO2	2	1	-	3	-	-	1			
CO3	3	2	3	2	1	2	2			
CO4	2	2	2	2	1	3	1			
CO5	2	3	3	2	1	3	1			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Dixit, Prasanna Kumar	Android	Vikas Publication, New Delhi 2014, ISBN : 9789325977884
2	Maclean David , Komatineni Satya, Allen Grant	Pro Android 5	Apress Publications, 2015, ISBN :978-1-4302-4680-0
3	Hortan, John	Android Programming for Beginners	Packet Publications, 2015, ISBN : 978-1-78588-326-2
4	Pradeep Kothari	Android Application Development	Kogent Learning Solutions ISBN : 9789351194095

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.udemy.com/topic/android-development	Introduction to Android Operating system
2	https://onlinecourses.swayam2.ac.in/nou21_ge41/preview	Introduction to Android IDE tools.
3	https://www.geeksforgeeks.org/android-tutorial/	Basics of GUI components, layouts and views in android.
4	https://www.tutorialspoint.com/android/index.htm	Advanced components of android like intents, services, broadcast recevier and activities.
5	https://developer.android.com/training/data-storage/sqlite	Steps to insert and reteive data from the Databases.
6	https://developer.android.com/guide/topics/permissions/overview	Setting permissions in Android.
7	https://firebase.google.com/docs/database/android/start	Connectivity with Firebase database

MOBILE APPLICATION DEVELOPMENT **Course Code : 316006**

Sr.No	Link / Portal	Description

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

MSBTE Approval Dt. 04/09/2025 **Semester - 6, K Scheme**

Programme Name/s	**: Automobile Engineering./ Artificial Intelligence/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical and Electronics Engineering/ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Computer Hardware & Maintenance/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Production Engineering/ Computer Science/ Electronics & Computer Engg.**
Programme Code	**: AE/ AI/ AN/ AO/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DE/ DS/ EE/ EJ/ EK/ EP/ ET/ EX/ HA/ IE/ IF/ IH/ LE/ ME/ MK/ PG/ SE/ TE**
Semester	**: Sixth**
Course Title	**: CAPSTONE PROJECT**
Course Code	**: 316004**

I. RATIONALE

Capstone projects in engineering study are considered important as it allow students to integrate and apply the knowledge and skills acquired throughout their academic program and effectively demonstrating their learning of programme by tackling a real-world problem, ultimately keeping them well prepared for the job market. The capstone project is usually the final assignment and plays a vital role in preparing students for the world of work to its practical applications and ability to help hone students' professional knowledge and skills. Normally, capstone projects are developed in collaboration with industries or businesses, providing students with valuable insights. Capstone projects has been considered as an integral part of diploma curriculum. It helps learners to perform and demonstrate skills gained due to early courses of Diploma study independent. Therefore, this is considered as a course of final year/semester study.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Apply professional skills for solving , executing and demonstrating solutions to real-world problems

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Elaborate the identified field problem from the perspective of project work at institute.
- CO2 - Conduct feasibility & viability analysis (using data collection, experiments, Simulation , Coding) to validate required resources, cost, support of the project work.
- CO3 - Apply the acquired knowledge and skills in providing solutions to the real field/industrial problems.
- CO4 - Present Project and its output/ findings / achievements alongwith its exhibits.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
316004	CAPSTONE PROJECT	CPE	INP	-	-	2	2	4	2	-	-	-	-	-	50	20	50#	20	50	20	150

V. General guidelines for PROJECT WORK

- The Project- problems must be related to the programme or may be interdisciplinary, based on the industry expected outcomes.
- The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work they would like to execute.
- Project titles are to be finalized in co-ordination/consultation with the Faculty mentor. However, faculty may form a team of students as per specific roles- Literature survey/data collection, data Analysts, model/prototype developers, testers, Project managers using IoTs ITES and software /application development. Study type project is NOT advisable.
- Project must be assigned to a group of 3-4 students under the guidance of identified faculty mentor.
- Students are required to prepare a prototype/working model/software of the Project and simultaneously prepare a report.
- Students shall Submit One Hard copy and one Soft copy each of Project Report and soft-copy of the project code or the working model.
- Students must maintain a project execution diary having the progress steps and details. The concerned faculty should check the diary on a weekly basis and accordingly interact with students based on the progress shown and keep proper record with feedback if any.
- Project shall address National Thrust area such as Environment, Digitization, Automation, sustainability and similar domains.
- Student shall try to use the national and international standards wherever possible (processes / materials / equipments etc ..)

VI. Project facilitation guidelines:

Once the Project statement has been finalized and allotted to the students, the Faculty Mentor role is very important as guide, motivator, catalyser to promote learning and sustain the interest of the students. At the same time the Faculty Mentor is not expected to guide the students on each step, otherwise it will curb the creativity of the students-group. The Faculty Mentor has to work as a mentor. Following should be kept in mind while facilitating the project at the institute:

1.Project orientation cum -briefing: the project should be relevant to the curriculum of the programme. The project shall be cost effective taking safety aspects, ethical issues, environmental issues and confidentiality as per expectation of industry(if any) into consideration, The work may be industry Sponsored.

2.Information search and data collection: the information and data should be realistic and relevant to the problem /project. Hypothetical data is not to be taken into consideration.

3.Implementation and Monitoring: The project must have important steps /milestones to achieve as per the time frame/action plan prepared by students and faculty. The monitoring mechanism such as daily/weekly dairy **(Format given below)** must be clearly explained and delineated for the students.

VII.Criteria of Assessment /Evaluation of Project work

A. Formative Assessment (FA) criteria

The **Formative Assessment** (FA) of the students for 50 marks is to be done based on following criteria.

Appropriate RUBRICS may be used for assessment

Rubrics for Assessment of the team

Sr.No.	Criteria	Marks
1	Project Selection & Problem definition	05
2	Literature survey and data collection/ Gathering	05
3	Design / concept of project/ Working - Execution of Project	10
4	Stage wise progress as per Action plan/milestone	05
5	Quality Report Writing	05

Rubrics for Individual Assessment

Sr.No.	Criteria	Marks
1	Contribution as a team member	05
2	Depth of Knowledge	10
3	Presentation	05

B. Summative Assessment Criteria

- The summative assessment for 50 marks is to be done and based on following criteria. This assessment shall be done by the faculty mentor and External examiner.

Sr.No.	Criteria	Marks
1	Capstone Project Completion as per plan	10
2	Project related Requirement Analysis & Designing	10
3	Developing a Solution with proper justifications, Teamwork	10
4	Project Report Writing	10
5	Project Presentation	10

(**NOTE :** Team based and Individual performance based summative assessment may include Innovativeness , Technology used , user friendliness , cost effectiveness , society benefits etc..)

SUGGESTED RUBRIC FOR SUMMATIVE ASSESSMENT OF CAPSTONE PROJECT

PROJECT ASSESSMENT

Project Title:

Project Assessment Rubric

Performance	**Excellent**	**Good**	**Fair**	**Poor**
Criteria	**9-10 marks.**	**6-8 marks.**	**4-5 marks.**	**0-3 marks**
Capstone Project Completion	Excellent	Good	Fair	Poor
	The project is completed as per tasks described in synopsis.	**The project is completed but require minor modifications.**	**The project is completed but require several modifications.**	**The project is not completed as per tasks described in synopsis.**
Project related Requirement Analysis & Designing	**9-10 marks.**	**6-8 marks.**	**4-5 marks.**	**0-3 marks**
	Effectively contributed in requirement analysis and designing.	**Partially Contributed in requirement analysis and designing.**	**Attempted to contribute in requirement analysis and designing**	**No contribution in requirement analysis and designing.**
Developing a Solution with proper justifications , Teamwork	**9-10 marks.**	**6-8 marks.**	**4-5 marks.**	**0-3 marks**
	Developed the critical solution modules with Innovation, optimized design and worked very well with the team.	**Developed some solutions with higher complexity and worked well with the team.**	**Attempted to develop few solutions and worked with the team.**	**No contribution in developing a solution and in the team.**
Project Report Writing	**9-10 marks.**	**6-8 marks.**	**4-5 marks.**	**0-3 marks**
	Worked very well to submit an excellent project report .	**Worked well to submit the project report with covering all the aspects of a standard report.**	**Tried to submit the project report but standard of report was not satisfactory.**	**No contribution in project report writing.**
Project Presentation	**9-10 marks.**	**6-8 marks.**	**4-5 marks.**	**0-3 marks**
	Presented the project work flawlessly.	**Presented the project work very nice.**	**Presented the project work not so well.**	**Presentation skill is not up to the mark.**

Project Group Members

ROLL NUMBER/Enrollment Number				
NAME				

Comments (if any)

NOTE : " These are suggestive rubrics Faculty mentor and external examiner may frame different rubrics as per Programme need and assigned Project work "

C. Self Learning Assessment

Self Learning Assessment **Max Marks -50**

Sr.No.	Criteria	Max Marks	Marks Obtained
1	Project Selection & Problem definition	10	
2	Literature survey and data collection/ Gathering	05	
3	Design / concept of project/ Working - Execution of Project	15	
4	Stage wise progress as per Action plan/milestone/ psychomotor motor skills acquired	10	
5	Quality Report Writing	10	

VIII. CO-PO Mapping

CO-PO mapping will vary project wise and shall be prepared by concerned faculty for the given project

IX. Typographical instructions/guidelines for Project report writing

Following is the suggestive format for preparing the Project report. Actual report may differ slightly depending upon the nature of industry. The training report may contain the following.

a. The PROJECT report shall be computer typed (English- British) and printed on A4 size paper.
b. Text Font -Times New Roman (TNR), Size-12 point
c. Subsection heading TNR- 12 point bold normal
d. Section heading TNR- 12 capital bold
e. Chapter Name/ Topic Name – TNR- 14 Capital
f. All text should be justified. (Settings in the Paragraph)
g. The report must be typed on one side only with double space with a margin 3.5 cm on the left, 2.5 cm on the top, and 1.25 cm on the right and at bottom.
h. The training report must be hardbound/ Spiralbound with cover page in black colour. The name of the candidate, diploma (department), year of submission, name of the institute shall be printed on the cover [Refer sample sheet (outer cover)]
i. The training report, the title page [Refer sample sheet (inner cover)] should be given first then the Certificate followed by the acknowledgment and then contents with page numbers.

X. Project Report

On completion of the project work, every student will submit a project report which should contain the following:
1. Cover Page (as per annexure 1)
2. Title page (as per annexure 2)
3. Certificate by the Guide (as per annexure 3)
4. Acknowledgment (The candidate may thank all those who helped in the execution of the project.)
5. Abstract (It should be in one page and include the purpose of the study; the methodology used.)

6. Table of Contents (as per general guidelines): Detailed description of the project (This should be split in various chapters/sections with each chapter/section describing a project activity in totality).

Chapter–1 Introduction (background of the Industry or User based Problem/Task)
Chapter–2 Literature Survey (to finalize and define the Problem Statement)
Chapter–3 Scope of the project
Chapter–4 Methodology/Approach, if any
Chapter-5 Details of designs, working and processes
Chapter-6 Results and Applications

7. Conclusion
8. References (The listing of references should be typed 2 spaces below the heading "REFERENCES" in alphabetical order in single spacing left – justified. It should be numbered consecutively (in square [ ] brackets, throughout the text and should be collected together in the reference list at the end of the report. The references should be numbered in the order they are used in the text. The name of the author/authors should be immediately followed by the year and other details). Typical examples of the references are given below:

NOTE:

1. Project report must contain only a relevant and short mention – technology or platform or tools used. It must be more focussed on project work and its implementation
2. Students can add/remove/edit chapter names as per the discussion with their guide

Formats

Project Report

"Project Title----------"

as a partial fulfilment of requirement of the

THIRD YEAR DIPLOMA IN

Submitted by

1)Name Of Student	**Enrollment Number**
2)Name Of Student	**Enrollment Number**
3)Name Of Student	**Enrollment Number**
4)Name Of Student	**Enrollment Number**

Are the bonafide on

FOR THE ACADEMIC YEAR

20-----20---

(H.O.D)

(Principal)

(Internal Guide) **(External Examiner)**

Department Name

(If NBA Accredited mention that)
Institute Name

(An Affiliated Institute of Maharashtra State Board of Technical Education)

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Note:

***Students can add/remove/edit chapter names as per the discussion with their guide**

Annexure

PROJECT DIARY (Weekly/Daily)

Name of the Student : _____

Name of Guide (Faculty) : _____

Enrollment Number : _____ Semester: _____Project batch Number : _____

WEEK : _____

Date	Activity carried out (Details)	Achievement of mile stone/step as per plan	Remark of Faculty

Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			

Dated Signature of Faculty **Dated Signature of HOD**

MSBTE LOGO INST LOGO

Certificate

This is to certify that

Mr./Ms. *bearing examination seat No.* *has*

Satisfactorily completed his/her ***PROJECT*** *entitled*

Along with his/her batchmates in partial fulfillm ent for the

Diploma Course in

< PROGRAMME NAME>

Of the ***Maharashtra State Board of Technical Education*** *at our Polytechnic during the Academic Year20 -20 .*

The Project is completed by a group consisting of Persons under the guidance of the Faculty Guide

Faculty Name and Signature (Internal)	**Faculty Name and Signature (External if applicable)**	**HOD Name and Signature with Department Stamp**
Date and Time		

NETWORK AND INFORMATION SECURITY **Course Code : 316317**

Programme Name/s	**: Cloud Computing and Big Data/ Computer Technology/ Computer Engineering/ Computer Science & Engineering/ Computer Hardware & Maintenance/ Computer Science**
Programme Code	**: BD/ CM/ CO/ CW/ HA/ SE**
Semester	**: Sixth**
Course Title	**: NETWORK AND INFORMATION SECURITY**
Course Code	**: 316317**

I. RATIONALE

Network information security is to protect sensitive data and systems within a network from unauthorized access, modification, or disruption by implementing security measures. Students learn confidentiality, integrity, and availability of information, ensuring the smooth operation of critical business functions and minimizing potential damage from cyber threats and also able to implement various computer security policies.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the students to attain the following Industry Identified Outcomes through various teaching learning experiences: Implement policies and guidelines to maintain data security and privacy during data transmission.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Identify types of Cyber attacks and threats.
- CO2 - Apply multi-factor user authentication and access control.
- CO3 - Implement encryption/decryption techniques.
- CO4 - Use tools and techniques to prevent cyber attacks.
- CO5 - Apply security on Network and Database.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
316317	NETWORK AND INFORMATION SECURITY	NIS	DSE	3	-	2	1	6	3	3	30	70	100	40	25	10	25#	10	25	10	175

Total IKS Hrs for Sem. : 0 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Explain the need of information security. TLO 1.2 State criteria for information classification. TLO 1.3 Identify various types of attacks. TLO 1.4 Enlist types of Malware. TLO 1.5 Explain importance of Operating system updates. TLO 1.6 Establish relationship between threat, vulnerability, risks with suitable example.	**Unit - I Introduction to Computer and Information Security** 1.1 Foundations of computer security: Definition and Need of Computer Security, Security Basics: Confidentiality, Integrity, Availability, Accountability, Authentication, Non - repudiation and Reliability 1.2 Information Security Overview: Introduction to information, need and importance of information security, Information classification, Criteria for information classification 1.3 Type of Attacks: Active and Passive attacks, Masquerade Attack, Denial of Service, Backdoors and Trapdoors, Sniffing, phishing, Spoofing, Man in the Middle, Replay, TCP/IP Hacking, Social Engineering 1.4 Types of Malwares: Virus, Worms, Trojan horse, Spyware, Adware, Ransom ware, Logic Bombs, Rootkits, Key loggers 1.5 Operating system updates: HotFix, Patch, Service Pack 1.6 Threat to security: Introduction to assets, vulnerability, threats, risks, relation between threat, vulnerability, risks	Lecture Using Chalk-Board Presentations

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Apply different types of authentication methods. TLO 2.2 Apply various methods to prevent password from attacks. TLO 2.3 Illustrate the given biometric patterns. TLO 2.4 Explain the purpose of authorization. TLO 2.5 Compare DAC, MAC, RBAC and ABAC on the basis of given parameters.	**Unit - II User Authentication and Access Control** 2.1 Identification and Authentication methods: Electronic user authentication, user name and password, multi-factor authentication, token-based authentic 2.2 Password attacks: Guessing password, Piggybacking, Shoulder surfing, Dumpster diving 2.3 Biometrics: Finger prints, Hand prints, Retina scan patterns, Voice patterns, Face recognition, Signature and Writing patterns, Keystrokes 2.4 Authorization: Introduction to authorization, goals of authorization 2.5 Access controls: Definition, Authentication mechanism, Access control principles, Access rights and permission Access control policies: Discretionary access control (DAC), Mandatory access control (MAC), Role-based access control(RBAC),Attribute-based access control (ABAC)	Lecture Using Chalk-Board Presentations Video Demonstrations
3	TLO 3.1 Explain the process of encryption and decryption. TLO 3.2 Compare symmetric and asymmetric cryptography on the basis of given parameters. TLO 3.3 Use the substitution techniques on given text. TLO 3.4 Apply the transposition techniques on given text. TLO 3.5 Explain the concept of steganography.	**Unit - III Cryptography** 3.1 Introduction: Plain text, Cipher text, Cryptography, Cryptanalysis, Cryptology, Encryption, Decryption 3.2 Symmetric and Asymmetric cryptography : Introduction, working, key management, asymmetric cryptography -public key distribution 3.3 Substitution techniques : Caesar cipher, Play fair cipher, Vigenere cipher, Vernam cipher(One-timepad) 3.4 Transposition techniques: Railfence technique, Simple columnar technique 3.5 Steganography: Overview of steganography	Lecture Using Chalk-Board Presentations Video Demonstrations

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
4	TLO 4.1 Differentiate between hardware and software firewalls. TLO 4.2 Explain various firewall policies. TLO 4.3 Compare DES, AES and RSA algorithms with the given parameters. TLO 4.4 Apply Diffie-Hellman key exchange algorithm on the given text. TLO 4.5 Calculate hash value for given text using hash function algorithm. TLO 4.6 Explain working of Digital Signature.	**Unit - IV Firewall and Encryption Algorithms** 4.1 Firewall: Need of firewall, Types of firewalls: Packet filters, Stateful packet filters, Application gateways, Circuit gateways 4.2 Firewall policies, Configuration, Limitations, Demilitarized zone (DMZ) 4.3 DES (Data Encryption Standard) algorithm, AES (Advanced Encryption Standard) algorithm, RSA (Rivest-Shamir-Adleman) algorithm 4.4 Diffie-Hellman key exchange algorithm, Man-in- middle attack 4.5 Hash Function: Introduction, Features of Hash Functions, MD5 (Message Digest Method 5) and SHA(secure hashing algorithm) algorithm 4.6 Digital Signature: Introduction and working of digital signature, Digital Certificate	Lecture Using Chalk-Board Presentations Video Demonstrations Flipped Classroom
5	TLO 5.1 Compare Network Based and Host-Based IDS. TLO 5.2 Use Kerberos and IP Security Protocols on network security. TLO 5.3 Explain given protocol used for E-mail security. TLO 5.4 Explain need of database security. TLO 5.5 Explain cloud security.	**Unit - V Network and Database Security** 5.1 Intrusion Detection System(IDS):Network-based IDS, Host-based IDS, Honeypots 5.2 Kerberos: Working, Authentication Server (AS), Ticket Granting Service (TGS), Service Server (SS), IP Security: Overview, Authentication Header (AH), Encapsulating Security Payload (ESP) protocols, Transport and tunnel modes 5.3 E-mail security: Simple mail transfer protocol (SMTP), Pretty good privacy (PGP), Secure/Multipurpose Internet Mail Extensions (S/MIME), Privacy Enhance Mail (PEM) 5.4 Database Security: Need for database security, SQL injection attack, database encryption 5.5 Cloud security: Essential characteristics, service model, deployment model, cloud specific security threats	Lecture Using Chalk-Board Presentations Video Demonstrations

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Install Antivirus software on system. LLO 1.2 Apply privacy and security settings to protect operating system.	1	* i.Install and configure Antivirus software on system (Licensed copy) ii. Use privacy and security settings on operating system	2	CO1

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 2.1 Setup and recover password of computer system.	2	i. Set up single level authentication for computer system ii. Recover the password of computer system using any freeware password recovery tool (Example- John the ripper)	2	CO2
LLO 3.1 Grant read, write and execute permission on file and folder.	3	* i. Grant security to file, folder or application using access permissions and verify it ii. Grant access permission while sharing file and folder	2	CO2
LLO 4.1 Implement password authentication.	4	* Write a utility using C/Shell programming to create strong password authentication (Password should be more than 8 characters, and combination of digits, letters and special characters #, %, &, @)	2	CO2
LLO 5.1 Implement caesar cipher encryption technique.	5	* i. Write a C program to implement caesar cipher technique to perform encryption and decryption of text ii. Apply Caesar cipher technique to perform encryption and decryption of text using any open-source tool (Example - Cryptool)	2	CO3
LLO 6.1 Implement Vernam cipher encryption technique.	6	i. Implement Vernam cipher encryption technique to perform encryption of text using C programming language ii. Apply Vernam cipher technique to perform encryption and decryption of text using any open-source tool (Example - Cryptool)	2	CO3
LLO 7.1 Implement railfence encryption technique.	7	Implement railfence encryption technique to perform encryption of text using C programming language	2	CO3
LLO 8.1 Implement simple columnar transposition technique.	8	Implement simple Columnar Transposition encryption technique to perform encryption of text using C programming language	2	CO3
LLO 9.1 Generate Hash Code.	9	* Create and verify Hash Code for given message using any Open-source tool (Example-Cryptool)	2	CO3
LLO 10.1 Implement Diffie-Hellman key exchange encryption technique.	10	i. Write a C program to implement Diffie-Hellman key exchange algorithm to perform encryption of text ii. Use Diffie-Hellman key exchange algorithm to perform encryption and decryption of text using any open-source tool (Example - Cryptool)	2	CO4
LLO 11.1 Implement steganography.	11	* Use Steganography to encode and decode the message using any open-source tool (Example-OpenStego)	2	CO4
LLO 12.1 Generate digital signature.	12	* Create and verify digital signature using any Open-source tool (Example-Cryptool)	2	CO4
LLO 13.1 Generate digital Certificate.	13	Create and verify digital Certificate using any Open-source tool (Example-Cryptool)	2	CO4
LLO 14.1 Configure firewall.	14	Configure firewall settings on any operating system	2	CO4
LLO 15.1 Implement email security.	15	* Send a test mail securely using any open-source tool (Example- Pretty Good Privacy with GnuPG)	2	CO5
LLO 16.1 Use of email tracker pro.	16	Find the origin of email using email tracker pro	2	CO5

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Assignment

- Explain the role of digital signatures in verifying authenticity and integrity in a communication system.
- Describe the working of the RSA encryption algorithm showing generation of public and private key.
- Illustrate the use of cryptography in securing email communication.
- Encrypt the message "HELLO" using a Caesar Cipher with a shift of 3.
- Describe algorithms for symmetric and asymmetric cryptography.
- Explain the difference between active and passive security attacks. Provide examples of each.
- Compare and contrast DAC, MAC, and RBAC in terms of security, flexibility, and ease of use.
- Teachers shall give assignments covering all COs.

Micro project

- Implement communication system using steganography. Encrypt audio file and message using any cryptography technique.
- Implement communication system using steganography. Encrypt image and message using any cryptography technique.
- Implement Client/Server communication using cryptography tools in laboratory.
- User A wants to send message to user B securely on network.

i. Select any two techniques to encrypt message.
ii. Implement both the techniques.
iii. Evaluate result of implementation.
iv. Compare complexity of both techniques.
v. Prepare report.

- Prepare admin level report of company who wants to implement allocate fixed system to each employee for authentic access to maintain security.

i. Explain various single level authentication method available to access the system.
ii. Apply the weakness and security threats to this problem.
iii. Suggest multi factor authentication for given problem situation.
iv. Compare impact of single and multi-factor authentication on given situation.

- Create Digital Certificate for your department/personal communication.

Other

- Complete any course related to Network and Information Security on Infosys Springboard, NPTEL.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Steganography Tools (Open-source tool)	11
2	E-mail Security Tool (Open-source tool)	15
3	Any freeware password recovery tool	2
4	Any compiler (TurboC/Online 'C' compiler)	4,5,6,7,8,10
5	Encryption and decryption tool (Open-source tool: Cryptool)	5,6,7,8,9,10,12,13
6	Antivirus software (Licensed copy)	All
7	Computer System (Any computer system with basic configuration)	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Computer and Information Security	CO1	8	4	6	2	12
2	II	User Authentication and Access Control	CO2	8	4	4	4	12
3	III	Cryptography	CO3	10	2	6	6	14
4	IV	Firewall and Encryption Algorithms	CO4	9	2	4	10	16
5	V	Network and Database Security	CO5	10	4	8	4	16
Grand Total				**45**	**16**	**28**	**26**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continuous assessment based on process and product related performance indicators Each practical will be assessed considering

60% weightage to process
40% weightage to product
A continuous assessment based on term work

Summative Assessment (Assessment of Learning)

- End semester examination, Lab performance, Viva voce.

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	-	-	-	-	1	2			
CO2	2	1	1	1	2	2	2			
CO3	2	2	2	2	2	1	2			
CO4	2	2	2	2	2	1	2			
CO5	2	1	1	2	2	1	3			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	William Stallings, Lawrie Brown	Computer Security Principles and Practice, Third Edition	Pearson. ISBN-13: 978-0-13-377392-7
2	Atul Kahate	Cryptography and Network security Third Edition	McGraw-Hill; Fourth edition ISBN-13:978- 9353163303
3	Mark Merkow,Jim Breithaupt	Information Security Principles and Practices	Pearson. ISBN 978-81-317-1288-7
4	V. K. Pachghare	Cryptography and Information Security	Prentice Hall India ISBN:978-81-203-5082-3
5	Dieter Gollmann	Computer Security	Wiley publication, New Delhi, ISBN: 978-0-470-74115-3

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=NlpnJE0m-NU	Simulation of Intrusion Detection System in MANET using NetSim
2	https://archive.nptel.ac.in/courses/106/106/106106129/	NPTEL course on Introduction to Information Security
3	https://onlinecourses.swayam2.ac.in/cec22_cs15/preview	Swayam course onI nformation Technology
4	https://www.youtube.com/watch?v=T9c5ZpT2FV0	Firewall configuration
5	https://cse29-iiith.vlabs.ac.in/List%20of%20experiments.html	Virtual lab for cryptography
6	https://www.geeksforgeeks.org/active-and-passive-attacks-in-information-security/	Types of Attacks

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Sr.No	Link / Portal	Description
7	https://brightsec.com/blog/sql-injection-attack/	SQL injection

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students